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October 4, 2013

Mr. Ramon Mendoza
Remedial Project Manager
USEPA Region 5
77 West Jackson Boulevard
Mail Code: SE-5J
Chicago, IL 60604-3507

Dear Mr. Mendoza,

Please find enclosed the Plainwell No. 2 Dam Area Fall 2013 Bank Repair Plan Technical Memorandum. This Technical Memorandum was prepared in follow up to the conference call with USEPA, MDEQ, the Michigan Department of Natural Resources (MDNR), the National Oceanic and Atmospheric Administration (NOAA), the United States Fish and Wildlife Service (USFWS), Georgia-Pacific, Amec and ARCADIS held on September 23, 2013 to discuss the conceptual maintenance/repair plan. USEPA and the Trustees conceptually agreed to the bank repair strategy pending review of a detailed work plan. This Technical Memorandum serves as the detailed bank repair work plan and will be implemented following USEPA approval.

Please let me know if you have any questions on the submittal. We appreciate your timely review and approval so that the initial part of the work may be scheduled and completed during November.

Sincerely,

Garry Griffith, PE
Georgia-Pacific LLC

Enclosure
cc: Jim Saric, USEPA
Paul Bucholtz, MDEQ
Sharon Hanshue, MDNR,
Mark Mills, MDNR
Lisa Williams, US F&W
Judith Alfano, MDEQ
Julie Sims, NOAA
Todd Goeks, NOAA
Joe Rathbun, MDEQ
Eric Hritsuk, Arcadis
Heather VanDewalker, ARCADIS
Chase Fortenberry, Georgia-Pacific
Garret Bondy, Amec

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MEMO

To:
Garry Griffith, Georgia-Pacific

Copies:
Anthony Esposito, ARCADIS
Eric Hritsuk, ARCADIS

From:
Heather VanDewalker, ARCADIS

Date:
October 4, 2013

ARCADIS Project No.:
B0064536.0004.00907

Subject:

Plainwell No. 2 Dam Area Fall 2013 Bank Repair Plan Technical Memorandum

Georgia-Pacific LLC (Georgia-Pacific) and ARCADIS have been conducting an annual monitoring program in the Plainwell No. 2 Dam Area (Figure 1) to observe and document various characteristics of the floodplains and river banks since completion of the Time-Critical Removal Action (TCRA), implemented in the area in 2009-2010. Per the Administrative Settlement Agreement and Order on Consent for Removal Action (AOC) for the Plainwell No. 2 Dam Area, Docket No. V-W-09-C-925, dated June 8, 2009 (USEPA 2009), bank monitoring is required annually for a period of three years. The three-year monitoring period, which started following the issuance of a *Notice of Completion of Work* by the United States Environmental Protection Agency (USEPA) on March 1, 2011 (USEPA 2011), will end on March 1, 2014.

On June 11, 2013, ARCADIS, on behalf of Georgia-Pacific, performed annual bank monitoring activities. The Plainwell No. 2 Dam Area Spring 2013 Bank Conditions Monitoring Report (Spring 2013 BCMR; ARCADIS 2013a) describes the relevant performance standards and methodology used for the monitoring activities along with a summary of results.

Also, on June 11, 2013, Georgia-Pacific LLC (Georgia-Pacific), the United States Environmental Protection Agency (USEPA), and the Michigan Department of Environmental Quality (MDEQ) participated in a collaborative onsite inspection/meeting referred to as the Agency Annual Site Inspection to inspect and discuss observed bank conditions at the Plainwell No. 2 Dam Area on the Kalamazoo River near

Plainwell, Michigan (Figure 1). During the Agency Annual Site Inspection, USEPA and MDEQ requested that new survey bank profiles at four locations (Removal Areas 2, 3A, 4A, and 4B; Figure 2) be compared to 2010 post-construction bank survey data to evaluate temporal changes in bank conditions.

In response to this request, Prein & Newhof of Grand Rapids, Michigan surveyed the banks at the four locations on July 10 and 11, 2013. The 2013 and 2010 bank profiles were compared to evaluate differences in bank morphology as an indicator of bank stability. There is no quantifiable performance standard included in the monitoring program for bank stability, so the comparison of bank geometry over time is used in combination with the visual inspection to evaluate bank conditions.

The results of bank profile survey (Figure 3) were submitted to USEPA and MDEQ in the Spring 2013 BCMR (ARCADIS 2013a). Based upon review of the bank profile survey cross-sections, Georgia-Pacific and ARCADIS concluded that three of the four bank areas required maintenance to minimize the potential for future erosion (ARCADIS 2013a).

A follow up conference call with Georgia-Pacific, USEPA, MDEQ, the Michigan Department of Natural Resources (MDNR), the National Oceanic and Atmospheric Administration (NOAA), the United States Fish and Wildlife Service (USFWS)[1], and ARCADIS was held on September 23, 2013 to discuss the conceptual maintenance/repair plan. USEPA and the Trustees conceptually agreed to the bank repair strategy pending review of a detailed work plan. This Technical Memorandum serves as the detailed bank repair work plan and will be implemented following USEPA approval.

Location of Bank Repair Areas

During the Agency Annual Site Inspection, four areas were identified by USEPA and MDEQ as exhibiting signs of erosion. Following review of post-construction and newly surveyed bank profiles of these areas, three of the areas (Removal Areas 2, 3A, and 4A) were identified as requiring repairs and are addressed in this memorandum.

USEPA and MDEQ also identified a fourth area - Removal Area 4B - as exhibiting signs of erosion; however, based upon evaluation of the bank profile survey data, the current bank slope in Removal Area 4B (Figure 3; T-18) is very similar to the post-construction condition. No significant erosion appears to have occurred at this location; and therefore, bank repair is not warranted in this area.

[1] MDEQ, MDNR, NOAA, and USFWS are collectively referred to as The Trustees and are not a signatory to the 2009 Administrative Settlement agreement and Order on Consent for Removal Action for the Plainwell No. 2 Dam Area, Docket No. V-W-09-C-925 (USEPA 2009).

Bank Repair Option Assessment

Banks at this site have historically been restored using some combination of the following, based upon the expected post-construction potential for erosion:

- Armor stone with underlying geotextile fabric from the toe of slope to the median flow elevation[2]
- Coir log at the median flow elevation
- Woody vegetation above the median flow elevation
- Seeding above the median flow elevation

During TCRA design, the potential for erosion in Removal Areas 2, 3A, and 4A was considered low; therefore, the use of armor stone and coir log was not warranted. Well-established and deeply rooted vegetation was expected to sufficiently stabilize the restored bank. This design appeared to be performing as planned during the bank inspections completed in 2011 and 2012. However, as stated in Section 1.1.2 of the Spring 2013 BCMR (ARCADIS 2013a), the frequency and duration of water levels higher than median flow elevation in the first half of 2013 has negatively impacted the development of vegetation on the bank. Vegetation that had been established since construction was completed in 2009 was unable to provide the required protection from erosive forces. To remedy this situation, the bank needs to be stabilized this construction season at and below the median water level while vegetation is reestablished above the median flow elevation.

The four repair options listed above as well as a fifth option – brush wattles with large woody debris – were evaluated. Assessments of the feasibility of implementing each option are presented below:

<u>Armor Stone with underlying geotextile fabric</u>

Coir log and angular rip rap were installed along approximately 150 linear feet of bank in Removal Area 3A (River Station 208+50 to 210+00) in January 2013 to prevent future erosion (ARCADIS 2013b). Removal Area 3A is located at the end of the primary site access road, which was left in place at the conclusion of the construction. Angular rip rap was used because the local supply of rounded river run rock was depleted, as it was used during initial restoration. Based on follow up inspections of the repaired area, it appears that 10 to 20 percent of the angular rip rap is fracturing and eroding. This is not atypical for the angular rip rap supplied by the local quarries, and the majority of the degradation will occur during the first freeze/thaw cycle. At this time, it does not appear that the eroded rock is affecting the ability of the remaining rock to effectively protect the bank. Georgia-Pacific submitted a memorandum to USEPA to further explain the characteristics of the riprap in September 2013 (Georgia-Pacific 2013).

[2] Defined as 950 cubic feet per second (cfs) by the Plainwell No. 2 Dam Area TCRA Final Design Report (ARCADIS 2009).

Installation of armor stone requires the use of dump trucks to deliver the stone and an excavator to deploy the stone. Since all access roads have been removed from the site, it is not feasible to deploy the equipment to remote areas of the site without destroying vegetation and installing new access roads.

Due to the quality of available local rock and equipment requirements, use of armor stone is not considered to be a viable option at this time.

Coir Logs

Coir logs were used during initial restoration and during the 2013 repair of Removal Area 3A (ARCADIS 2013b) to provide additional energy dissipation and erosion protection at the waterline until bank vegetation establishes enough to provide long-term bank stability. Coir logs are effective when properly installed. The coir log is generally installed at the median flow elevation. However, during periods of frequent inundation, the coir log is submerged and cannot adequately provide the required energy dissipation and bank protection. In addition, the stakes and twine used to anchor the coir log in place have historically been subject to damage from the sun, water forces, bioactivity, and degradation, resulting in the loss of some coir logs.

Due to the challenges associated with accurately placing and effectively anchoring coir logs, use of this material is not considered to be a viable option at this time.

Brush Wattles and Woody Debris

Brush wattles and woody debris have not been used at the Plainwell No. 2 Dam Area before, but have effectively been used on the Kalamazoo River at the Enbridge spill response site. The brush wattles and woody debris, much like coir logs, provide energy dissipation and erosion protection at the waterline until bank vegetation establishes enough to provide long-term bank stability. However, the height along the bank of the brush wattles and woody debris can be more easily increased to provide wider coverage along the water/bank interface, which provides additional protection during periods of flows above the median flow elevation. Brush wattles and woody debris can be secured to the bank with natural cut wood posts. The natural cut wood posts are expected to be more resistant to damage than twine and stakes. Brush wattles are generally secured together using ¼-inch biodegradable rope. This rope is not used to secure the brush wattles to the banks, but is used to secure the individual brush together to form a wattle. In the event the rope breaks, the wattles are still secured to the bank using the natural cut wood posts and tend to intertwine together, reducing the likelihood that the wattles will wash away without the rope. The use of brush wattles and woody debris is considered the primary option at this time due to its increased protection and longevity.

Woody Vegetation

Woody vegetation was used during initial bank restoration and has been used at the former Plainwell Impoundment as a bank repair technique. The densely planted, deeply-rooted native shrubs provide long term bank stabilization after the woody debris biodegrades. The use of woody vegetation continues to be a preferred option for increasing bank stability and will be implemented as a part of this work plan.

Conceptual Design of Bank Repair Areas

Based on the considerations presented above, brush wattles, woody debris, and live woody vegetation will be used to repair banks identified during 2013 monitoring activities. The bank repairs will be implemented in Removal Area 2 (River Station 213+00 to 217+50; Figure 4), Removal Area 3A (River Station 207+00 to 208+50; Figure 5), and Removal Area 4A (River Station 199+00 to 201+00; Figure 6). Details of the bank repair implementation are provided in the following sections and Figures 4 through 6.

Brush Wattles and Woody Debris

Areas designated for bank repair will be stabilized utilizing a combination of brush wattles and large woody debris. Brush wattles will be constructed primarily of dead and downed woody material gathered from the adjacent woodlot. As needed, live material will be selectively harvested in close coordination with the landowner's contracted forester to minimize impacts to desirable timber. Brush wattles will be bundled into groupings of 12 to 18 inches in diameter and 5 to 30 feet long. Wattles shall be placed along the bank and interspersed with large woody debris, which will consist of 6 to 18 inch diameter logs, also harvested from the adjacent woodlot. The total height of the combination of brush wattles and large woody debris will generally match the bank height from the top-of-bank to 2-3 feet below the median water elevation. All brush wattles and woody debris will be secured to the bank with natural cut wood posts installed every 3 feet. Natural ¼-inch biodegradable manila rope will be used to bundle the brush wattles together. Brush wattles and woody debris will be installed in 2013.

Live Woody Vegetation

Following brush wattle and woody debris installation, 2 rows of native shrubs (in either bare-root or shrub plug form) will be installed and spaced approximately 2 feet on-center. Species shall be primarily *Cornus amomum*, *Cornus sericea*, and *Salix* spp. Shrubs will be installed in the spring of 2014 to maximize the potential for survivability.

Seeding

Based on visual observations, vegetation is well-established in areas that have not been frequently inundated. Brush and grasses will also not provide the erosion protection required to stabilize the repair

areas. In addition, brush wattles, large woody debris, and live woody vegetation can be installed without the use of heavy equipment that would disrupt established vegetation. Therefore, re-seeding the bank repair areas at this time is not expected to be warranted.

Implementation

If this technical memorandum/work plan is approved by USEPA by October 31, 2013, the brush wattles and woody debris will be installed by December 31, 2013. Live woody vegetation will be planted in the spring of 2014.

Figures

Figure 1 – Plainwell No. 2 Dam Area Site Location Map

Figure 2 – Plainwell No. 2 Dam Area Bank Profile Locations

Figure 3 - Plainwell No. 2 Dam Removal Area Bank Profile Transects

Figure 4 - Plainwell No. 2 Dam Removal Area 2 Proposed Bank Erosion Repair Plan and Cross-Section

Figure 5 - Plainwell No. 2 Dam Removal Area 3A Proposed Bank Erosion Repair Plan and Cross-Section

Figure 6 - Plainwell No. 2 Dam Removal Area 4A Proposed Bank Erosion Repair Plan and Cross-Section

References

ARCADIS. 2009. Plainwell No. 2 Dam Area Time-Critical Removal Action Design Report. Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. July.

ARCADIS 2013a. Plainwell No. 2 Dam Area Spring Bank Conditions Monitoring Report. September.

ARCADIS 2013b. Former Plainwell Impoundment and Plainwell No. 2 Dam Area 2012 Bank Conditions Monitoring Report - Addendum 1. January.

Georgia-Pacific 2013. Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site Former Plainwell Impoundment Time-Critical Removal Action and Plainwell No. 2 Dam Area Time-Critical Removal Action Post Construction Monitoring and Maintenance

USEPA. 2009. Administrative Order on Consent for Removal Action (AOC or Order) for the Allied Paper Inc./Portage Creek/Kalamazoo River Superfund Site (Docket No. V-W-09-C-925). June.

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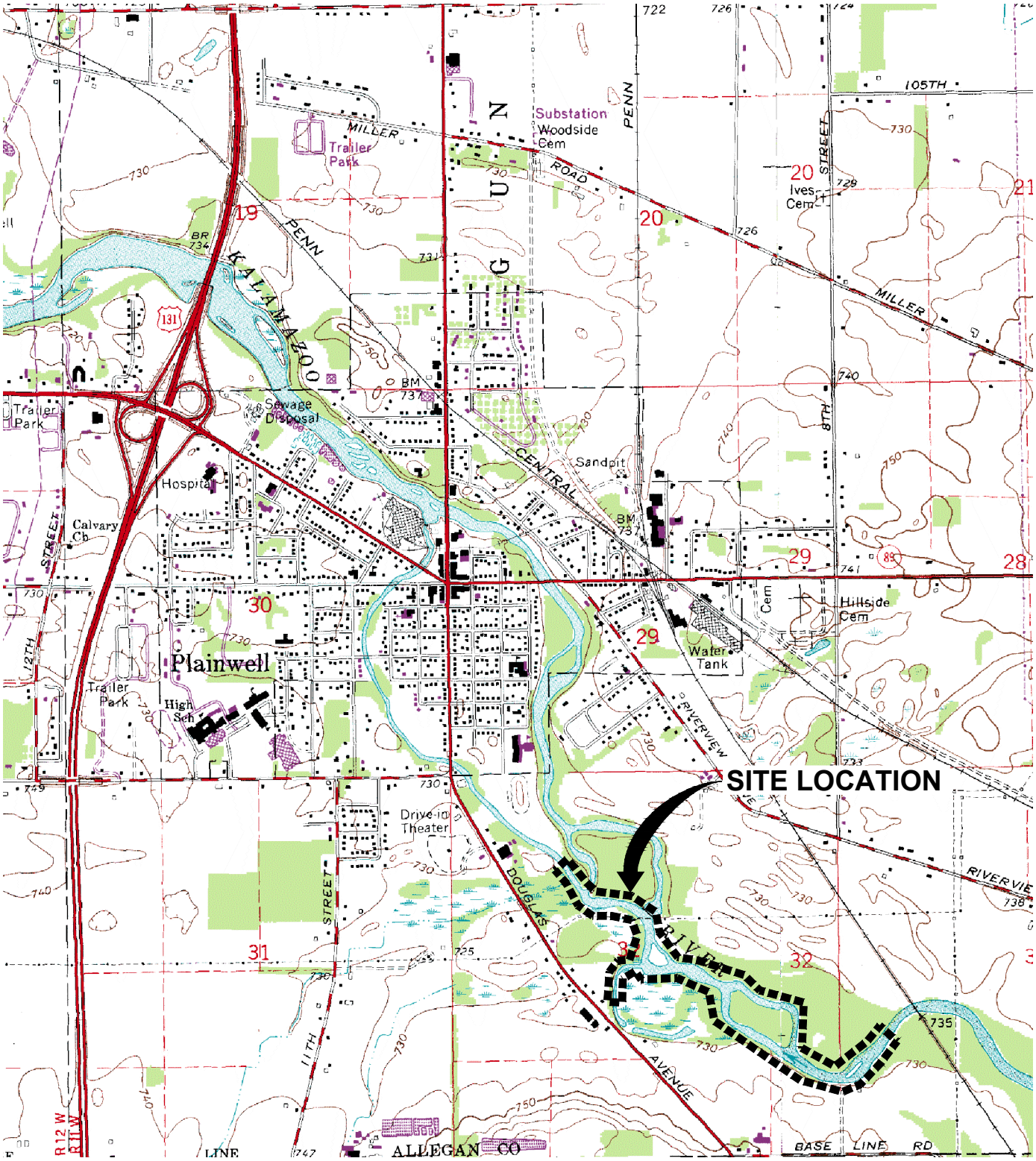
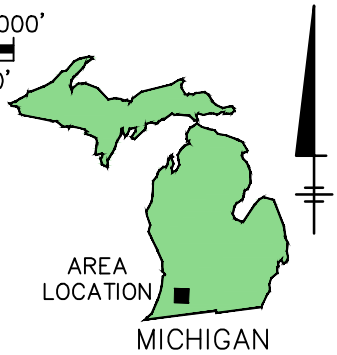
Figures



REFERENCE: USGS QUADS., 7.5 MIN. SERIES, DRG TOPOGRAPHIC MAP - ALLEGAN COUNTY, KALAMAZOO MICHIGAN.

0 2000' 4000'

Approximate Scale: 1" = 2000'



GEORGIA-PACIFIC LLC
ALLIED PAPER, INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL NO. 2 DAM AREA
FALL 2013 BANK REPAIR PLAN TECHNICAL MEMORANDUM

PLAINWELL NO. 2 DAM AREA SITE LOCATION MAP

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FIGURE 1

CITY:SYRACUSE DIV/GROUP:ENV/CAD DB: A. SAMIOS PMS. GARBACIAK LYR: ON=*;OFF=*REF*
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KALAMAZOO RIVER

FLOW

15+00
20+00
25+00
30+00
35+00
38+00
40+00
45+00
50+00
55+00
60+00
62+00
65+00
70+00
75+00
80+00
100+00
105+00
105+39
200+00
205+00
210+00
215+00
217+31

REMOVAL AREA 6
REMOVAL AREA 5A
REMOVAL AREA 5B
REMOVAL AREA 5B FLOODPLAIN
OXBOW MOUTH
OXBOW
REMOVAL AREA 4A
REMOVAL AREA 4B
REMOVAL AREA 3A
ISLAND 2
REMOVAL AREA 3B
REMOVAL AREA 1
REMOVAL AREA 2
ISLAND 1

T-17
T-16
T-18
T-15

DOUGLAS AVE

LEGEND:

- 730 — ELEVATION CONTOUR
- APPROX. LIMIT OF FIELD SURVEY
- MEDIAN WATER LINE (APPROX.)
- TAX PARCEL LINE
- 60+00 — STATION POINT (IN HUNDREDS OF FEET)
- KALAMAZOO RIVER CENTERLINE AND STATION LINE
- ACCESS ROAD
- KALAMAZOO RIVER
- LIMIT OF REMOVAL AREA (APPROX.)
- IN-STREAM EXCAVATION AREA
- SOIL EXCAVATION AREA
- RIVER RUN ROCK INCLUDED AS A PART OF DESIGN AND INSTALLED DURING CONSTRUCTION ACTIVITIES (SEE NOTE 5)
- RIVER RUN ROCK AND COIR LOG INSTALLED POST–CONSTRUCTION IN RESPONSE TO OBSERVED BANK CONDITIONS (SEE NOTE 5)
- T-15 — SURVEYED BANK PROFILE REQUESTED BY USEPA TO FURTHER EVALUATE BANK CONDITION (SEE NOTE 6)
- AREA OF PROPOSED BANK REPAIR

NOTES:

1. APPROXIMATE LIMITS OF FIELD–BASED SURVEY DELINEATES AREA WHERE TOPOGRAPHIC INFORMATION IS BASED ON SURVEY DATA COLLECTED DURING FIELD WORK IN 1993, 2000, 2007, AND 2008, WHICH INCLUDED SEDIMENT AND SOIL SAMPLE COLLECTION, TRANSECT SURVEYS, PROBING ACTIVITIES, AND DETAILED BANK SURVEY PERFORMED BY PREIN & NEWHOF APRIL THROUGH JUNE 2009. TOPOGRAPHIC INFORMATION OUTSIDE APPROXIMATE LIMITS OF FIELD–BASED SURVEY IS BASED ON AERIAL SURVEY INFORMATION PROVIDED BY AXIS GEOSPATIAL, LLC (JOB NUMBER: 8068NE, DATE FLOWN: DECEMBER 29, 2008, CONTOUR INTERVAL: 1 FOOT).
2. APPROXIMATE MEDIAN WATER LINE BASED ON HYDRAULIC MODELING ANALYSIS.
3. TAX PARCELS OBTAINED FROM ALLEGAN COUNTY LAND INFORMATION SERVICES GIS DEPARTMENT AND INCLUDE GUN PLAIN TOWNSHIP AND PLAINWELL CITY AND ARE PROJECTED IN NAD 83 STATE PLANE MICHIGAN SOUTH.
4. EXISTING FACILITIES, STRUCTURES, AND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE PLANS, RECORDS AND SURVEYS, AND, THEREFORE, THEIR LOCATIONS, MATERIALS, AND TYPE OF USE MUST BE CONSIDERED APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES AND UTILITIES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL STRUCTURES AND UTILITIES.
5. RIVER RUN ROCK LIMITS SHOWN ON THIS FIGURE DEPICT LOCATION OF ROCK PLACEMENT AND ARE NOT EXACT BOUNDARIES.
6. PROFILE LOCATIONS AND LENGTHS SHOWN ON THIS FIGURE ARE APPROXIMATE.

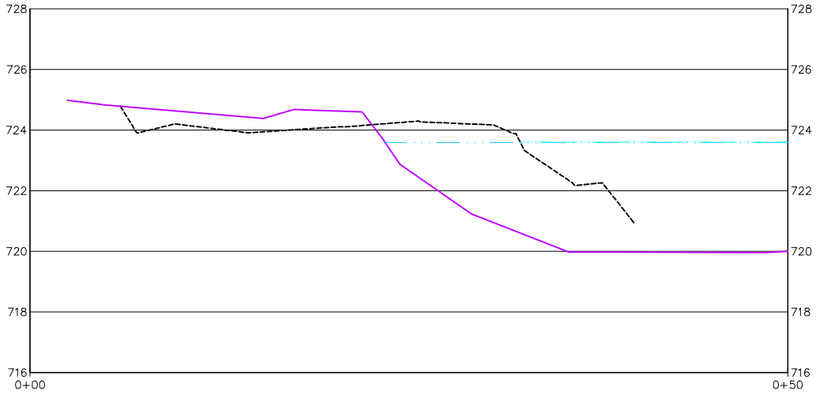
0 200' 400'
GRAPHIC SCALE

GEORGIA-PACIFIC LLC
ALLIED PAPER INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL NO. 2 DAM AREA
FALL 2013 BANK REPAIR PLAN TECHNICAL MEMORANDUM

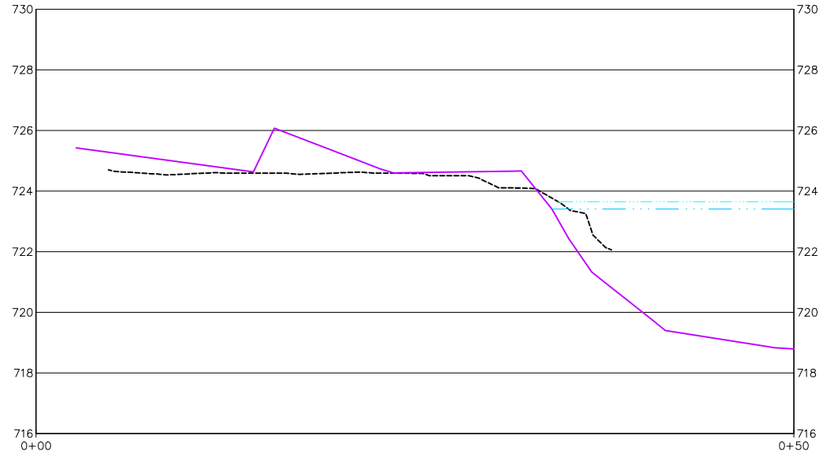
PLAINWELL NO. 2 DAM AREA BANK PROFILE LOCATIONS

ARCADIS

FIGURE
2



T-15



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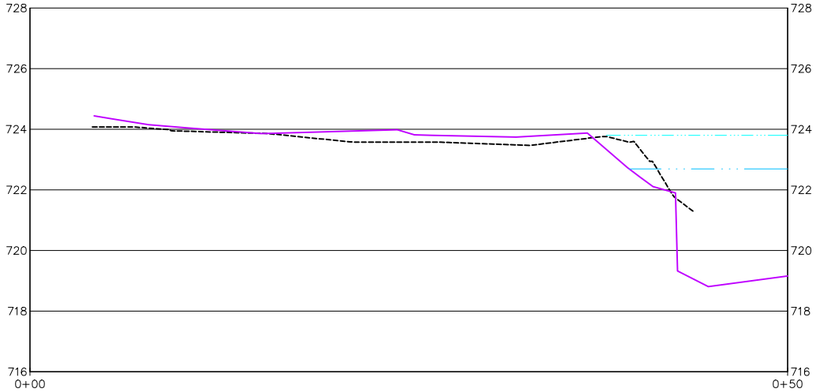
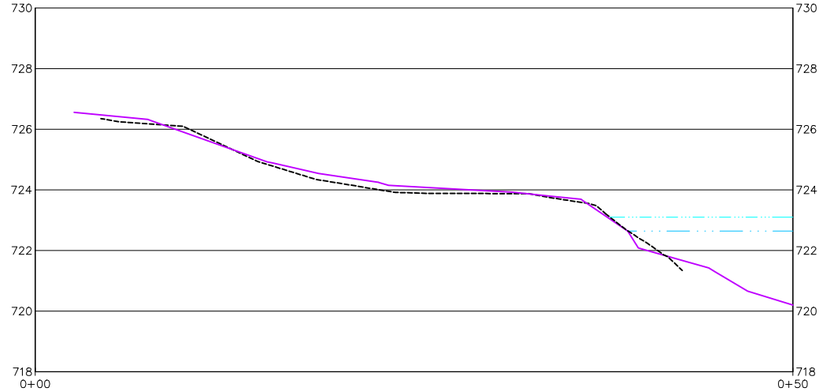


T-17



T-18

LEGEND:

- FINISHED GRADE/RESTORATION SURFACE (2010)
- 2013 SURVEYED GRADE (JULY 2013)
- WATER ELAVATION AT TIME OF SURVEY (JULY 2013)
- MEDIAN WATER ELEVATION (APPROX.)

0 5' 10'
GRAPHIC SCALE
(2X VERTICAL EXAGERATION)

GEORGIA-PACIFIC LLC
ALLIED PAPER INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL NO. 2 DAM AREA
FALL 2013 BANK REPAIR PLAN TECHNICAL MEMORANDUM

PLAINWELL NO. 2 DAM AREA BANK PROFILE TRANSECTS

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FIGURE
3

CITY: SYRACUSE DV/GROUP: 141ENV DB: AGS LD: AGS PIC: PM: PNM TM: EJH LYR:ON=*;OFF=*REF*
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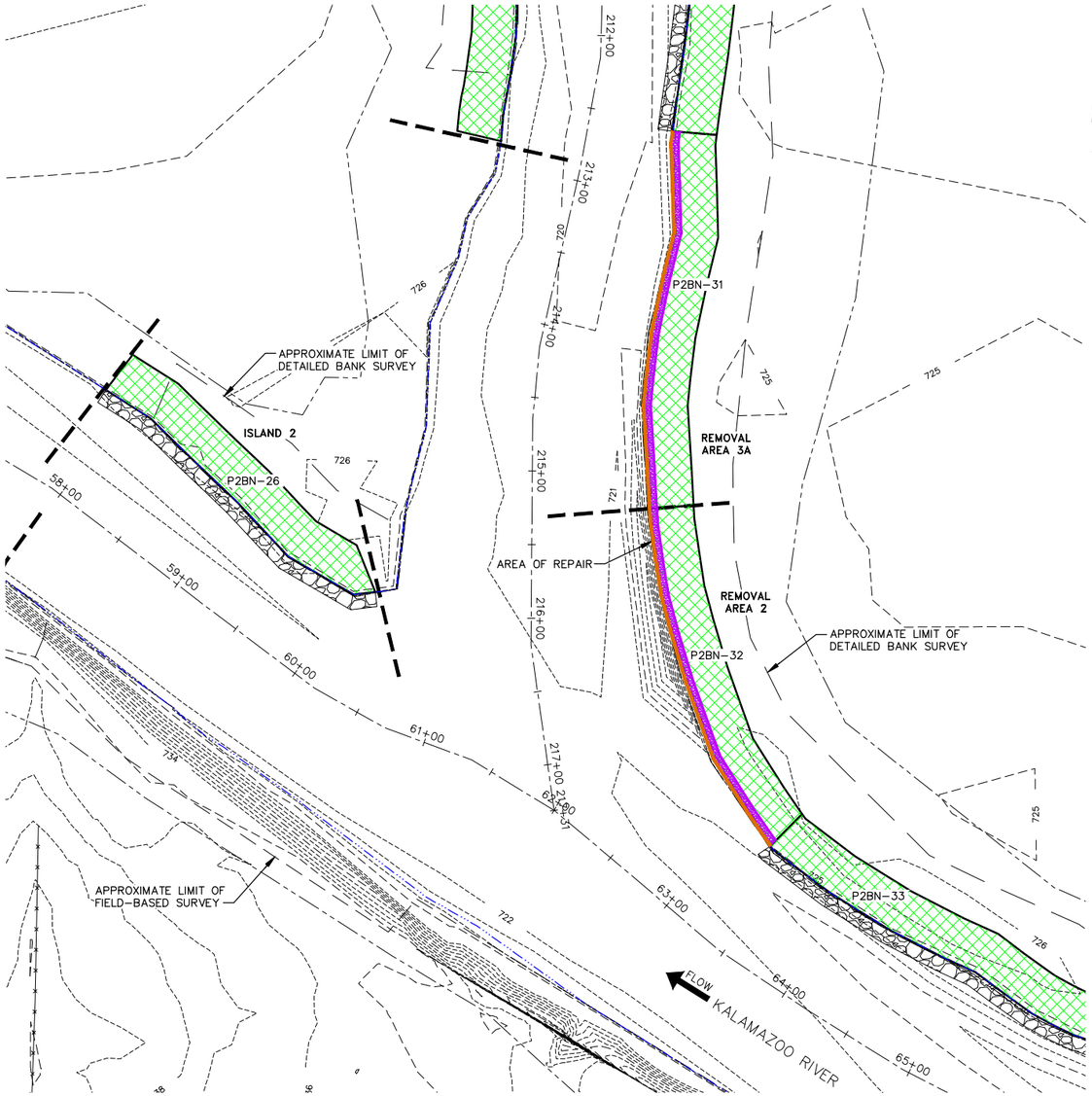


PLAN VIEW

0 50' 100'

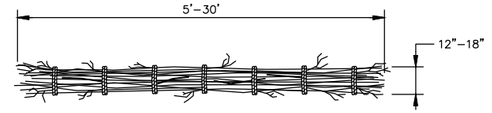
GRAPHIC SCALE

LEGEND:

209+00	STATION POINT (IN HUNDREDS OF FEET)
	KALAMAZOO RIVER CENTERLINE AND STATION LINE
725	ELEVATION CONTOUR
	APPROX. LIMIT OF FIELD SURVEY
	APPROX. LIMIT OF REMOVAL AREA
	APPROX. MEDIAN WATER LINE
	EXISTING VEGETATION
	EXISTING RIVER RUN ROCK
	BRUSH WATTLES AND WOODY DEBRIS
	LIVE WOODY VEGETATION

BASEMAP NOTES:

1. APPROXIMATE LIMITS OF FIELD–BASED SURVEY DELINEATES AREA WHERE TOPOGRAPHIC INFORMATION IS BASED ON SURVEY DATA COLLECTED DURING FIELD WORK IN 1993, 2000, 2007, AND 2008, WHICH INCLUDED SEDIMENT AND SOIL SAMPLE COLLECTION, TRANSECT SURVEYS, PROBING ACTIVITIES, AND DETAILED BANK SURVEY PERFORMED BY PREIN & NEWHOF APRIL THROUGH JUNE 2009. TOPOGRAPHIC INFORMATION OUTSIDE APPROXIMATE LIMITS OF FIELD–BASED SURVEY IS BASED ON AERIAL SURVEY INFORMATION PROVIDED BY AXIS GEOSPATIAL, LLC (JOB NUMBER: 8068NE, DATE FLOWN: DECEMBER 29, 2008, CONTOUR INTERVAL: 1 FOOT). HORIZONTAL DATUM FOR ALL SURVEY INFORMATION IS STATE PLANE, NAD 83, MICHIGAN SOUTH ZONE (2113), INTERNATIONAL FEET. VERTICAL DATUM IS U.S.G.S. NGVD 29. UNITS ARE U.S. SURVEY FEET.
2. APPROXIMATE MEDIAN WATER LINE BASED ON HYDRAULIC MODELING ANALYSIS. WATER LINE VARIED THROUGHOUT FIELD ACTIVITIES.

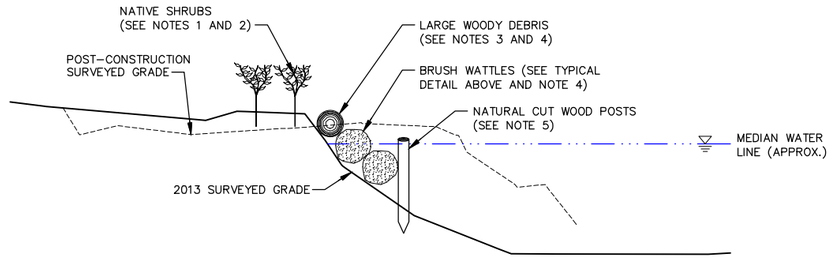


NOTES:

1. BRUSH WATTLES SHALL BE BUNDLED INTO GROUPINGS OF 12 TO 18 INCHES IN DIAMETER AND 5 TO 30 FEET LONG.
2. BRUSH WATTLES SHALL BE PREPARED WITH 1/4 TO 1/2 INCH CUTTINGS WITH ALTERNATING BUTT–ENDS.
3. BRUSH WATTLES SHALL BE SECURELY TIED EVERY 12 TO 15 INCHES USING 1/4 INCH BIODEGRADABLE MANILA ROPE.

TYPICAL BRUSH WATTLE

NOT TO SCALE



NOTES:

1. BARE–ROOT NATIVE SHRUBS SHALL BE INSERTED INTO THE UNDERLYING SOIL IN TWO ROWS AT 2–FOOT SPACING ON CENTER.
2. BARE–ROOT NATIVE SHRUBS SHALL BE 18 TO 24 INCHES IN LENGTH. SPECIES SHALL BE PRIMARILY CORNUS AMOMUM, CORNUS SERICEA, AND SALIX SPP.
3. LARGE WOODY DEBRIS SHALL CONSIST OF 6 TO 18 INCH DIAMETER LOGS.
4. WATTLES SHALL BE PLACED ALONG THE BANK AND INTERSPERSED WITH LARGE WOODY DEBRIS. THE TOTAL HEIGHT OF THE WATTLES/DEBRIS SHALL GENERALLY EXTEND FROM 2–3 FEET BELOW THE MEDIAN WATER LINE TO THE TOP–OF–BANK, BUT MAY BE ADJUSTED BASED ON SITE SPECIFIC CONDITIONS. THE RATIO OF WATTLES TO WOODY DEBRIS IS BASED ON MATERIAL AVAILABILITY AND FIELD CONDITIONS.
5. BRUSH WATTLES AND WOODY DEBRIS SHALL BE STAKED TO THE BANK USING 4 TO 6 INCH DIAMETER NATURAL CUT WOOD POSTS TO SECURE THE MATERIAL. STAKES SHALL BE PLACED APPROXIMATELY EVERY 3 FEET.

TYPICAL REPAIR SECTION

NOT TO SCALE
(2X VERTICAL EXAGGERATION)

GEORGIA-PACIFIC LLC
ALLIED PAPER INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL NO. 2 DAM AREA
FALL 2013 BANK REPAIR PLAN TECHNICAL MEMORANDUM

PLAINWELL NO. 2 DAM REMOVAL AREA 2 PROPOSED BANK EROSION REPAIR PLAN AND CROSS-SECTION

ARCADIS

FIGURE 4

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: A. SAMIOS LD: A. SAMIOS PM: P. MCGUIRE LYR:ON=*;OFF=*REF*
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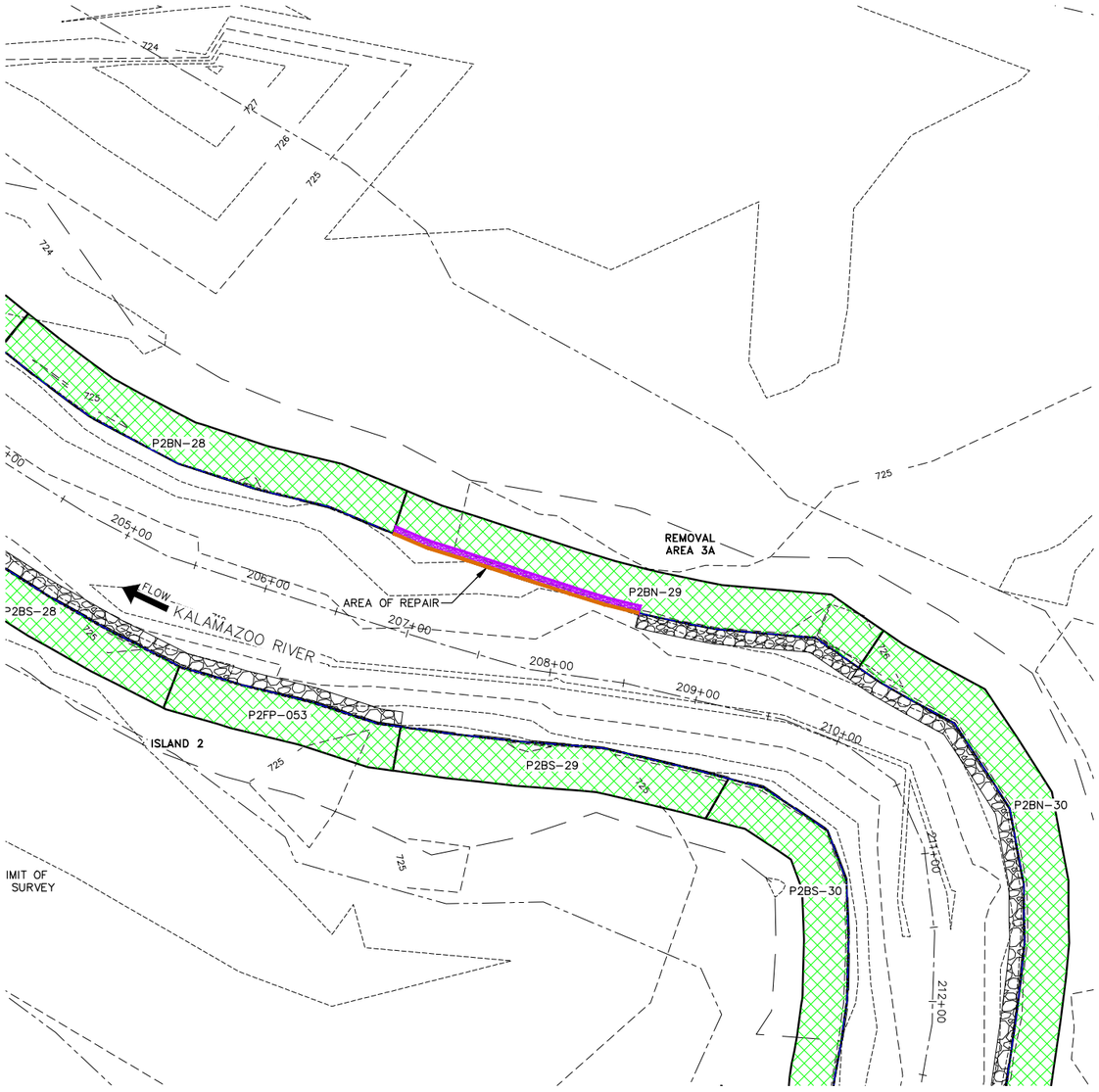
64539X02
IMAGES:



PLAN VIEW

0 50' 100'

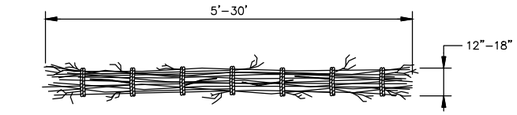
GRAPHIC SCALE

LEGEND:

- 209+00 — STATION POINT (IN HUNDREDS OF FEET)
- KALAMAZOO RIVER CENTERLINE AND STATION LINE
- 725 — ELEVATION CONTOUR
- APPROX. LIMIT OF FIELD SURVEY
- APPROX. LIMIT OF REMOVAL AREA
- APPROX. MEDIAN WATER LINE
- EXISTING VEGETATION
- EXISTING RIVER RUN ROCK
- BRUSH WATTLES AND WOODY DEBRIS
- LIVE WOODY VEGETATION

BASEMAP NOTES:

1. APPROXIMATE LIMITS OF FIELD-BASED SURVEY DELINEATES AREA WHERE TOPOGRAPHIC INFORMATION IS BASED ON SURVEY DATA COLLECTED DURING FIELD WORK IN 1993, 2000, 2007, AND 2008, WHICH INCLUDED SEDIMENT AND SOIL SAMPLE COLLECTION, TRANSECT SURVEYS, PROBING ACTIVITIES, AND DETAILED BANK SURVEY PERFORMED BY PREIN & NEWHOF APRIL THROUGH JUNE 2009. TOPOGRAPHIC INFORMATION OUTSIDE APPROXIMATE LIMITS OF FIELD-BASED SURVEY IS BASED ON AERIAL SURVEY INFORMATION PROVIDED BY AXIS GEOSPATIAL, LLC (JOB NUMBER: 8068NE, DATE FLOWN: DECEMBER 29, 2008, CONTOUR INTERVAL: 1 FOOT). HORIZONTAL DATUM FOR ALL SURVEY INFORMATION IS STATE PLANE, NAD 83, MICHIGAN SOUTH ZONE (2113), INTERNATIONAL FEET. VERTICAL DATUM IS U.S.G.S. NGVD 29. UNITS ARE U.S. SURVEY FEET.
2. APPROXIMATE MEDIAN WATER LINE BASED ON HYDRAULIC MODELING ANALYSIS. WATER LINE VARIED THROUGHOUT FIELD ACTIVITIES.

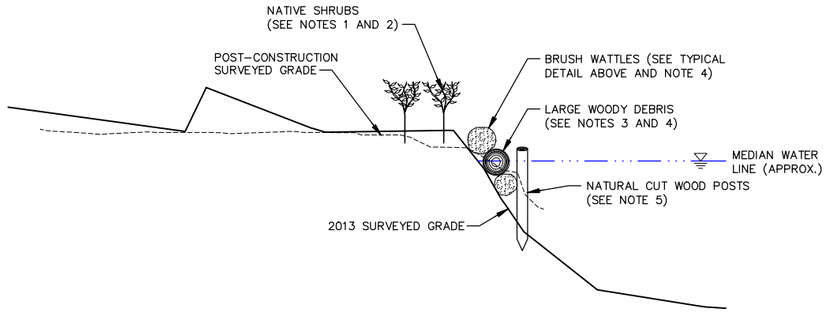


NOTES:

1. BRUSH WATTLES SHALL BE BUNDLED INTO GROUPINGS OF 12 TO 18 INCHES IN DIAMETER AND 5 TO 30 FEET LONG.
2. BRUSH WATTLES SHALL BE PREPARED WITH 1/4 TO 1/2 INCH CUTTINGS WITH ALTERNATING BUTT-ENDS.
3. BRUSH WATTLES SHALL BE SECURELY TIED EVERY 12 TO 15 INCHES USING 1/4 INCH BIODEGRADABLE MANILA ROPE.

TYPICAL BRUSH WATTLE

NOT TO SCALE



NOTES:

1. BARE-ROOT NATIVE SHRUBS SHALL BE INSERTED INTO THE UNDERLYING SOIL IN TWO ROWS AT 2-FOOT SPACING ON CENTER.
2. BARE-ROOT NATIVE SHRUBS SHALL BE 18 TO 24 INCHES IN LENGTH. SPECIES SHALL BE PRIMARILY CORNUS AMOMUM, CORNUS SERICEA, AND SALIX SPP.
3. LARGE WOODY DEBRIS SHALL CONSIST OF 6 TO 18 INCH DIAMETER LOGS.
4. WATTLES SHALL BE PLACED ALONG THE BANK AND INTERSPERSED WITH LARGE WOODY DEBRIS. THE TOTAL HEIGHT OF THE WATTLES/DEBRIS SHALL GENERALLY EXTEND FROM 2-3 FEET BELOW THE MEDIAN WATER LINE TO THE TOP-OF-BANK, BUT MAY BE ADJUSTED BASED ON SITE SPECIFIC CONDITIONS. THE RATIO OF WATTLES TO WOODY DEBRIS IS BASED ON MATERIAL AVAILABILITY AND FIELD CONDITIONS.
5. BRUSH WATTLES AND WOODY DEBRIS SHALL BE STAKED TO THE BANK USING 4 TO 6 INCH DIAMETER NATURAL CUT WOOD POSTS TO SECURE THE MATERIAL. STAKES SHALL BE PLACED APPROXIMATELY EVERY 3 FEET.

TYPICAL REPAIR SECTION

NOT TO SCALE
(2X VERTICAL EXAGGERATION)

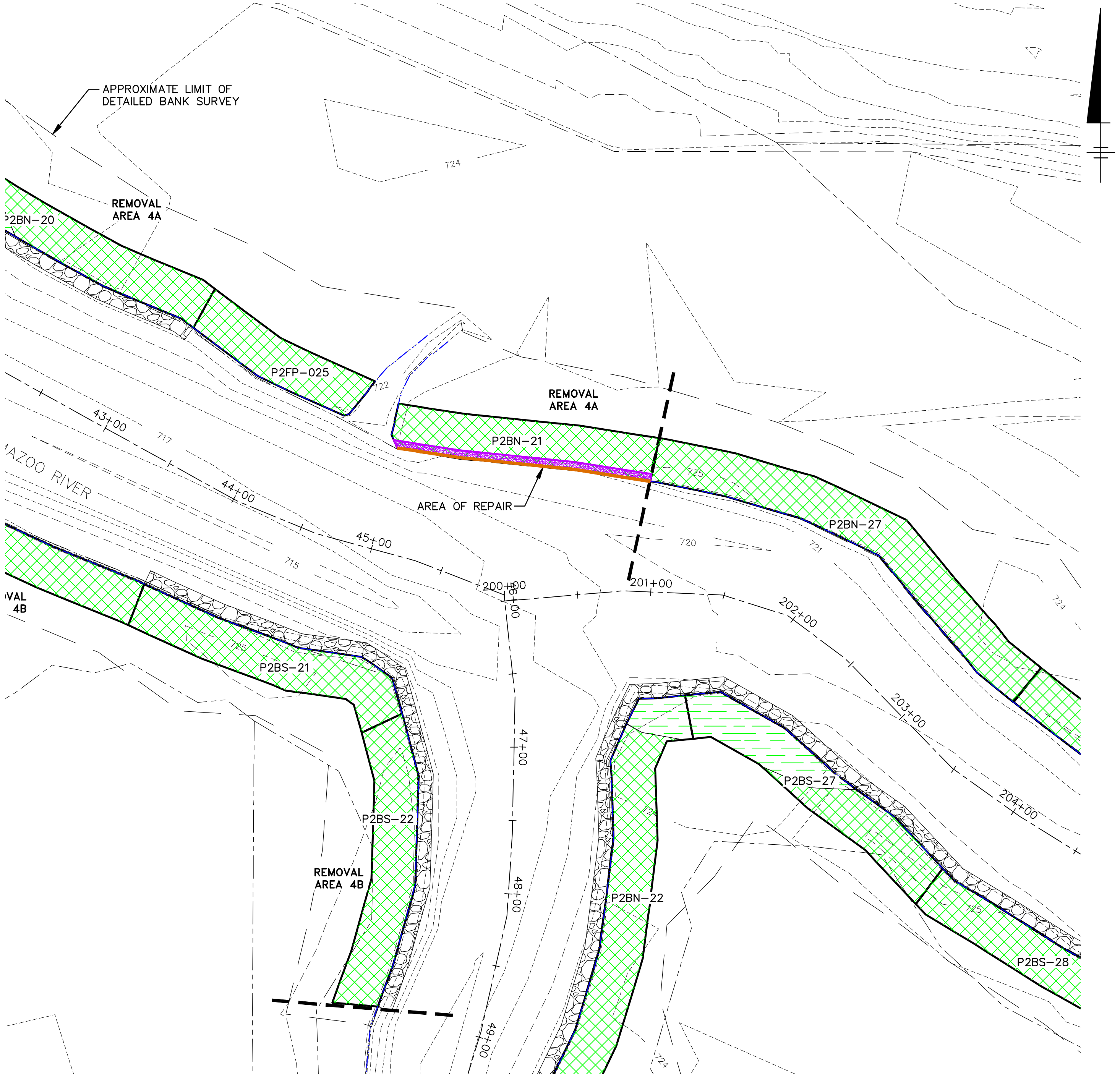
GEORGIA-PACIFIC LLC
ALLIED PAPER INC./PORTAGE CREEK/
KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL NO. 2 DAM AREA
FALL 2013 BANK REPAIR PLAN TECHNICAL MEMORANDUM

PLAINWELL NO. 2 DAM REMOVAL AREA 3A PROPOSED BANK EROSION REPAIR PLAN AND CROSS-SECTION

ARCADIS

FIGURE 5

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: A. SAMIOS LD: A. SAMIOS PM: P. MCGUIRE LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0064536\0004\00907\DWG\FALL BANK REPAIR\64536G07.DWG LAYOUT: 5 SAVED: 10/4/2013 9:37 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/4/2013 1:08 PM BY: SAMOS, ALEX
XREFS:
64536X00
64536X01
64539X02
IMAGES:



PLAN VIEW

0 50' 100'
GRAPHIC SCALE

LEGEND:

209+00	STATION POINT (IN HUNDREDS OF FEET)
——+——	KALAMAZOO RIVER CENTERLINE AND STATION LINE
- - - -725- - - -	ELEVATION CONTOUR
— — —	APPROX. LIMIT OF FIELD SURVEY
▬ ▬ ▬	APPROX. LIMIT OF REMOVAL AREA
—··—··—	APPROX. MEDIAN WATER LINE
(green crosshatch)	EXISTING VEGETATION
(rock pattern)	EXISTING RIVER RUN ROCK
(orange line)	BRUSH WATTLES AND WOODY DEBRIS
(purple line)	LIVE WOODY VEGETATION

BASEMAP NOTES:

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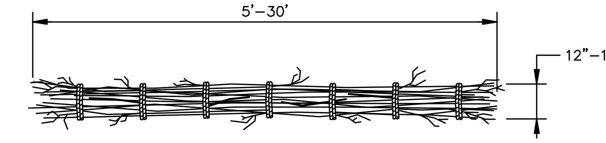

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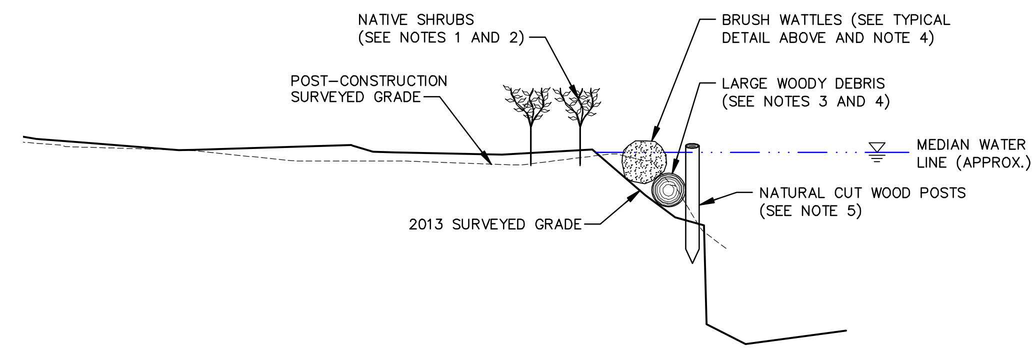
TYPICAL BRUSH WATTLE

NOT TO SCALE



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PLAINWELL NO. 2 DAM REMOVAL AREA4A PROPOSED BANK EROSION REPAIR PLAN AND CROSS-SECTION

ARCADIS

FIGURE
6